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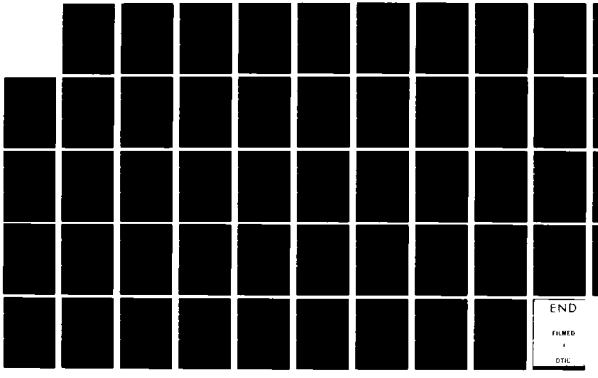

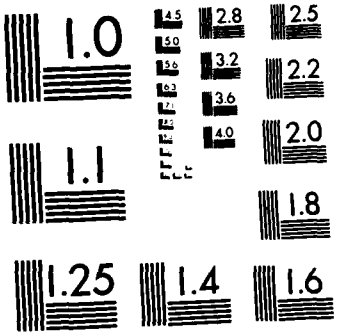

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SURFACE SHIP

INTERMEDIATE MAINTENANCE

October 1982

Brian E. Mansir
Joseph R. Wilk
William A. Woodring

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This report reviews surface ship intermediate maintenance performed by afloat and ashore intermediate maintenance activities (IMAs) and a wide variety of shore-based Navy and contractor organizations. Although the military-staffed IMAs perform most of the intermediate maintenance, they provide minimal support to the more complex equipments, such as weapon systems and sensors. They also have a minor role in the correction of high priority mission-degrading equipment deficiencies (CASREPTs). This limited IMA role for mission-essential equipments is inconsistent with the wartime need for rapid forward

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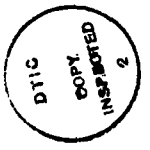
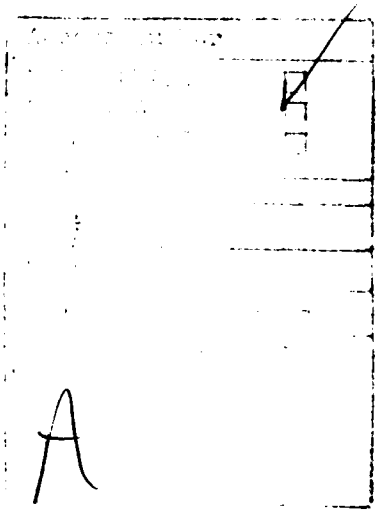
repair to sustain fleet combat operations. Most of the complex and combat-essential equipments are supported by civilian at shore-based, non-deployable activities. As a result, IMA mechanics are not receiving the necessary hands-on training in peacetime to effectively carry out their wartime responsibilities. We recommend the DoD place greater emphasis on ensuring that direct maintenance units (i.e., organizational and intermediate) are ready to perform their wartime missions. As an initial step, we suggest a joint OSD/Service dialogue to explore avenues for enhancing unit readiness. The discussion should place special emphasis on several key points which we feel are essential: (a) performance of direct maintenance by military units, (b) establishment of mission requirements for intermediate maintenance activities, (c) assignment of consistent peacetime and wartime maintenance missions for all maintenance organizations, and (d) limitation of the direct maintenance roles of non-military units to those which can be continued during wartime.

PREFACE

This report responds to concerns expressed by the Office of the Assistant Secretary of Defense (Manpower, Reserve Affairs and Logistics) about the Navy's intermediate maintenance capability to assure the readiness and sustainability of its surface combatant fleet.

An earlier LMI report, "A Survey of Navy Intermediate Maintenance," October 1981, documented the major problems affecting Navy intermediate maintenance for aircraft, submarines, and surface ships and described Navy initiatives to correct those problems. This current work documents the surface ship intermediate maintenance workload, the types of activities supporting that workload, and the role of intermediate maintenance activities in assuring fleet readiness and sustainability. It proposes the DoD place greater emphasis on the readiness of direct maintenance units (organizational and intermediate) to perform their expected wartime missions.





EXECUTIVE SUMMARY

Surface ship intermediate maintenance is performed by intermediate maintenance activities (IMAs), depots, and a wide variety of other shore-based Navy and contractor organizations. The military-staffed IMAs are the keystone of the Navy's intermediate maintenance system for surface ships. The afloat IMAs (tenders and repair ships) are the only deployable elements of that system.

The IMAs provide almost 45 percent of the intermediate maintenance man-hours consumed annually. Of that amount, 75 percent is devoted to hull, mechanical, and electrical maintenance; weapon system and sensor repairs account for less than 10 percent. The IMAs have only a minor role in the correction of high priority, mission-degrading equipment failures. For the most part, those are corrected by ship's force (organizational level). For those requiring correction off-ship, i.e., above organizational level, nearly 60 percent are accomplished by depots and other Navy and contractor activities; IMAs correct only a small percentage. Thus, intermediate maintenance on the complex and high priority equipment is being provided at shore-based, nondeployable activities. While this support may be cost-effective in meeting peacetime equipment readiness objectives, it makes combat sustainability even more difficult, if not unattainable.

The limited IMA role in the support of combat essential equipment is not consistent with the wartime need for rapid forward repair to sustain fleet combat operations. For critical systems and end items, repairs during wartime will likely be performed outside the theater of operations, with the associated long supply lines, lengthy repair times, and reliance upon heavily taxed airlift capability.

We recommend that DoD place greater emphasis on ensuring that direct maintenance units (i.e., organizational and intermediate) are ready to perform their wartime missions. To achieve this, we suggest, as an initial step, a joint OSD/Service dialogue to explore avenues for enhancing unit readiness. We have developed a discussion draft directive to serve as a framework for that forum. The discussion draft places special emphasis on several key points which we feel are essential to attaining the desired unit readiness: (a) performance of direct maintenance by military units, (b) establishment of mission requirements for intermediate maintenance activities, (c) assignment of consistent peacetime and wartime maintenance missions for all maintenance organizations, and (d) limitation of the direct maintenance roles of non-military units to those which can be continued during wartime.

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1. SURFACE SHIP INTERMEDIATE MAINTENANCE WORKLOAD AND ACCOMPLISHMENT

The Navy's system for accomplishing surface ship intermediate maintenance is essentially in balance -- the work is being accomplished at approximately the same rate it is being generated (the amount of deferred intermediate maintenance is not growing).

This chapter describes the activities that support the Navy's surface ship intermediate maintenance requirements, discusses the relationship among those activities, and provides estimates of their maintenance workload.[1]

THE MAINTENANCE ACTIVITIES

Intermediate maintenance consists of work beyond the capability of the organizational level but not requiring the heavy industrial facilities or specialized capabilities unique to the depot level. Surface ship intermediate maintenance is performed by a variety of afloat and ashore maintenance activities:

- Intermediate Maintenance Activities (IMAs)
- Commercial Industrial Services (CIS) Contractors
- Depots
- Other Navy and Contractor Activities.

There are 19 IMAs supporting surface ships: 9 destroyer tenders (ADs), 4 repair ships (ARs), and 6 shore IMAs (SIMAs).[2] The IMAs principally perform hull, mechanical, and electrical work; they perform limited weapon system and sensor repairs. With the exception of some maintenance advisory teams, the

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[1]Detailed maintenance workload data are presented in Appendix A.

[2]Excluding aircraft carriers and the SIMA at Norfolk which supports aircraft carriers.

ADs and ARs constitute the Navy's deployable intermediate maintenance capability. The SIMAs, while performing the same types of maintenance as the ADs and ARs, provide a shore-based intermediate support capability and rotational billets ashore for maintenance personnel.

The CIS Program provides commercial maintenance services on a rapid response basis. The program is restricted to selected organizational-level tasks and those intermediate-level tasks which are routinely satisfied by at least one local IMA and beyond the aggregate shop capacity of all local IMAs.

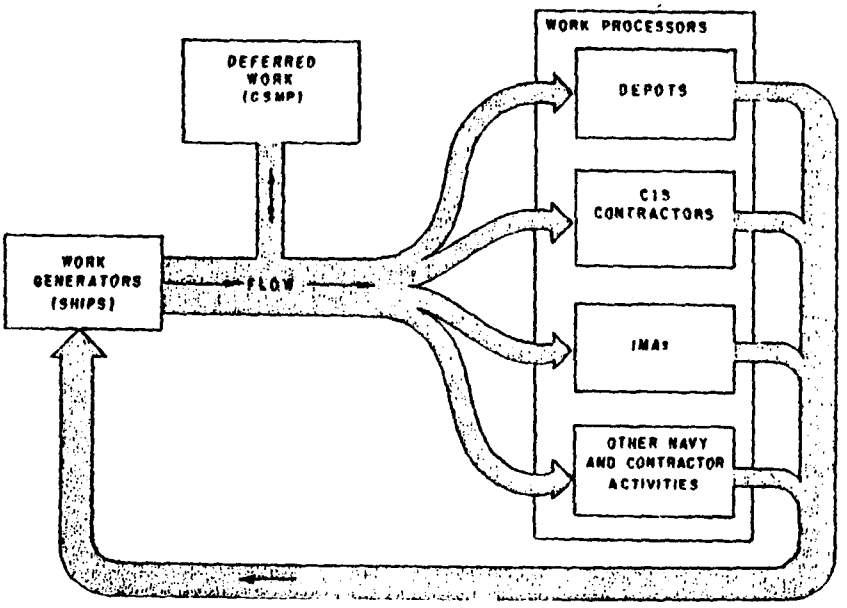
The Depots (Navy and commercial shipyards and other specialized factory-type facilities) primarily perform depot-level maintenance. During restricted and technical availabilities and overhauls, they also perform intermediate-level maintenance.

Other Navy and Contractor Activities consist of Mobile Technical Units (MOTUs), Naval Sea Centers (NAVSEACENs), Naval Electronics Systems Command Field Support Offices (NAVELEX FSOs), several specialized Navy activities, and numerous contractors. The MOTUs are military organizations which provide technical assistance and training to organizational-level maintenance personnel, primarily on shipboard electronics and weapon systems. The NAVSEACENs are focal points for Naval Sea Systems Command systems and equipments. They provide technical assistance much like the MOTUs, but for a greater variety of systems and equipment; unlike the MOTUs, they are predominantly civil service organizations. The NAVELEX FSOs provide technical assistance for selected electronic systems and equipments. Whereas MOTUs focus on technical problems of mature systems, NAVELEX FSOs assist on newly fielded systems and equipments. The Contractor Activities generally provide "one-time" maintenance services not covered by the CIS Program.

The relationship among the activities that perform surface ship intermediate maintenance can be described in the context of a closed-loop maintenance

system (Figure 1-1) in which the ships are work generators, and Navy and contractor activities are the work processors.

FIGURE 1-1. CLOSED-LOOP MAINTENANCE SYSTEM



Repair work which is neither mission-degrading nor planned for corrective action within 30 days is deferred until the ship has an available work processing period. The administrative mechanism for deferring or storing work is the Current Ship's Maintenance Project (CSMP). The CSMP, therefore, functions as a buffer between the continuous work generation of the ships and the cyclical work processing by the IMAs, depots, etc.

THE MAINTENANCE WORKLOAD

Within the last few years, several estimates of the Navy's surface ship intermediate maintenance workload have been developed. Those estimates are summarized in Table 1-1. As expected, the IMAs dominate the intermediate maintenance workload; they perform 44 percent of the Navy total. Organizations staffed by non-military personnel also have a large responsibility for surface ship intermediate maintenance -- well over 30 percent (counting, as a

minimum, depots, CIS Contractors and a portion of the category for Other Navy and Contractor Activities.)

TABLE 1-1. ANNUAL INTERMEDIATE MAINTENANCE WORKLOAD

Work Processing Activity	Workload (Millions of Man-Hours)	Workload as Percent of Total
IMAs	7.8	44
CIS Contractors	2.1	12
Other Navy and Contractor Activities	4.3	25
Depots		
Restricted and Technical Availabilities	2.3	13
Overhauls	1.1	6
Total Intermediate Workload	17.6	100

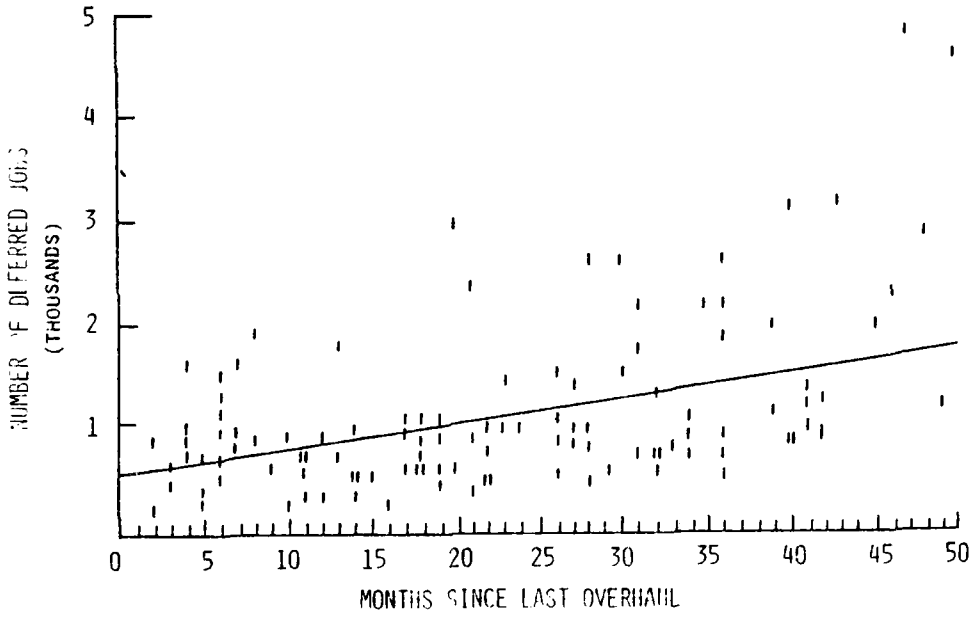
THE DEFERRED WORKLOAD

The amount of deferred work in the fleet is a significant indicator of the health of the Navy's maintenance system. Extrapolations of Surface Force, Atlantic (SURFLANT) CSMP data indicate that the combined CSMPs for all Navy surface ships contain between 5 and 6 million man-hours of intermediate-level deferred work. Based upon the scheduling of maintenance availabilities for surface ships and the rate at which work is generated, the CSMP should contain 3 to 6 months of deferred work. The estimated 5 to 6 million man-hours of work in the CSMPs is consistent with that expectation. This implies that the generation of intermediate-level work and the satisfaction of that work are essentially in balance.

The growth rate of deferred work between overhauls is another indicator of the health of the work processing system. It measures the difference between the rates of work generation and work production. Deferred intermediate maintenance work in SURFLANT is increasing at an average rate of 11.28 jobs per month per ship (Figure 1-2). This translates into a Navy-wide

surface fleet total of approximately 1.2 million man-hours of deferred intermediate work being added annually. Conversely, the data show that the average ship leaving overhaul has almost 19,000 fewer deferred intermediate maintenance man-hours than when entering overhaul. Extrapolation of these data, using the FY81 overhaul schedule, shows that on an annual basis intermediate-level deferred work eliminated during overhauls is about equivalent to that added to fleet CSMPs.

FIGURE 1-2. GROWTH OF DEFERRED INTERMEDIATE MAINTENANCE WORK IN SURFLANT



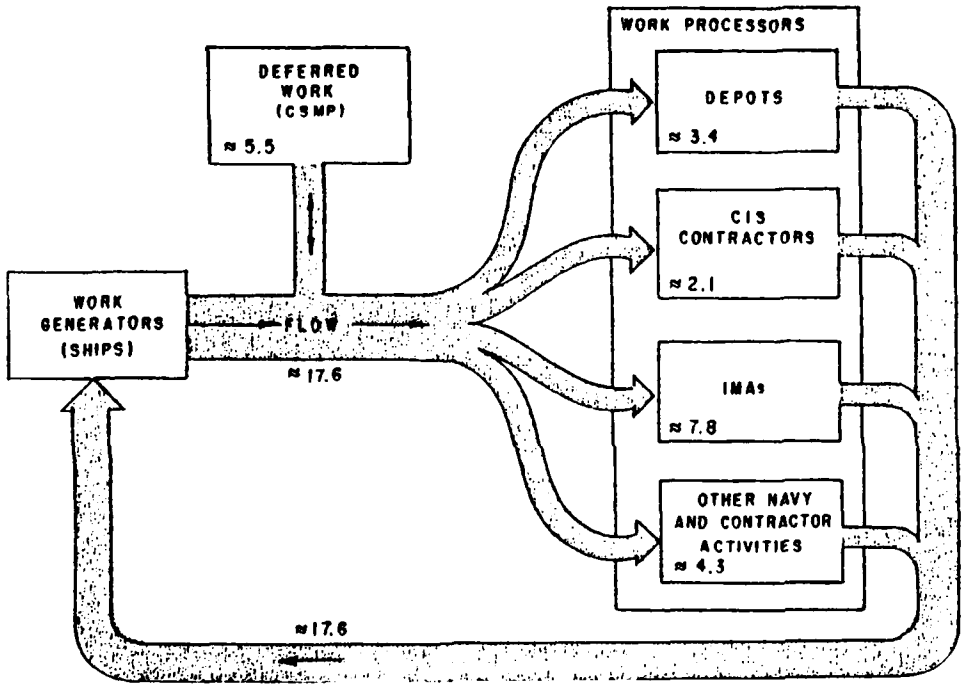
CONCLUSIONS

Figure 1-3 depicts how the workload fits into the closed-loop maintenance system. Surface ship intermediate maintenance is essentially in balance -- the work is being accomplished at approximately the same rate it is being generated (the amount of deferred intermediate maintenance is not growing). The ships generate the maintenance requirements continuously while the work processors satisfy most of the requirements during cyclic

availabilities and overhauls. (Between availabilities and overhauls, the requirements for intermediate maintenance are logged in the CSMP.) The total amount of deferred intermediate-level maintenance is not inconsistent with the availability/overhaul cycles nor does it appear to be growing.

FIGURE 1-3. THE ACCOMPLISHMENT OF SURFACE SHIP INTERMEDIATE MAINTENANCE

(Millions of Man-Hours)



2. READINESS, SUSTAINABILITY, AND IMA PERFORMANCE

For a military force to be a credible deterrent or an effective counter force to aggression, it must be ready and able to fulfill its required missions. The force must have not only the quality of immediacy but also sustainability. The IMAs, as the Navy's major surface ship intermediate maintenance assets, are vital to the fleet meeting its readiness and sustainability objectives.

This chapter describes the reporting of equipment readiness, examines the contribution of surface ship IMAs to equipment condition readiness, discusses the IMA's effect on fleet sustainability, and reviews the impact of IMA problems on their performance.

READINESS

Readiness Reporting

The reporting of surface ship readiness indicates, at a given point in time, a ship's capability to perform its assigned missions. A ship's overall readiness rating is characterized by one of four conditions:

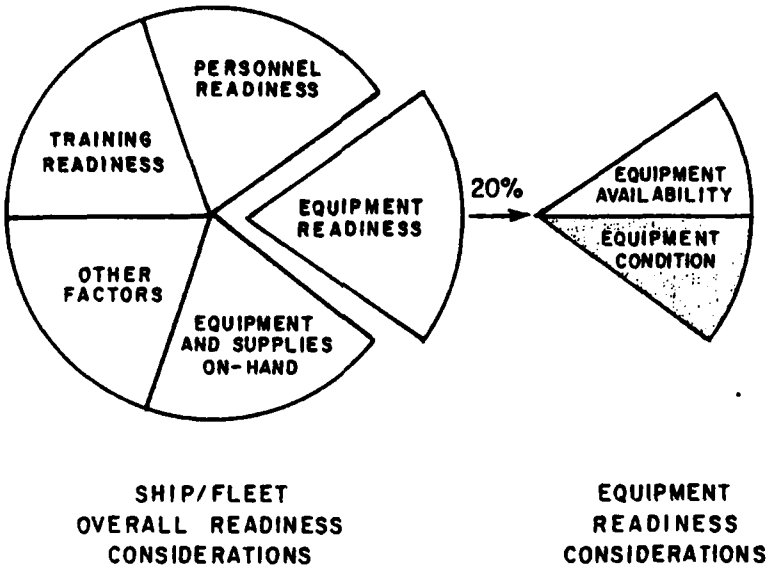
- C-1 Fully Ready. Capable of effectively performing in all assigned primary mission areas.
- C-2 Substantially Ready. Minor deficiencies which reduce its effectiveness in one or more primary mission areas; however, these degradations do not cause a loss of any primary mission area.
- C-3 Marginally Ready. Major deficiencies which reduce its effectiveness in one or more mission areas; however, these degradations do not cause a loss of more than one primary mission area.
- C-4 Not Ready. Deficiencies worse than C-3 and, for all practical purposes, these degradations cause loss of two or more primary mission areas.

The readiness of each ship is based upon four resource readiness areas as well as several other factors. The resource readiness areas are: (1) personnel, (2) training, (3) equipment and supplies on hand, and (4) equipment readiness. The other factors include morale, environment, qualification of individuals, and day-to-day performance in primary mission areas. Except for personnel and available equipment and supplies, for which deficiencies are measured numerically, deficiencies in resources are indicated by such terms as "insignificant," "minor," and "major."

The personnel rating compares the assigned strength of the ship with its authorized wartime strength. This rating is based upon the ship attaining percentage goals for total strength, mission-essential petty officers, and mission-essential Navy Enlisted Classifications (NECs). The training rating compares unit (i.e., the entire ship) training with prescribed standards. Even though the rating considers the results of recent training exercises, evaluations, operational readiness inspections, and technical proficiency tests, it remains largely subjective. The equipment and supplies on-hand rating compares available mission-essential equipment and supplies, regardless of condition, with the ship's allowance. The equipment readiness rating addresses both the availability and operating condition of mission-essential equipment.

In determining the ship's overall readiness rating, the four resource areas and the other factors are given essentially equal weight (Figure 2-1). The lowest rating in any of the five areas defines the maximum overall readiness rating for the ship. The IMAs influence only one of these areas, equipment readiness, and within that area, only equipment condition.

FIGURE 2-1. READINESS CONSIDERATIONS

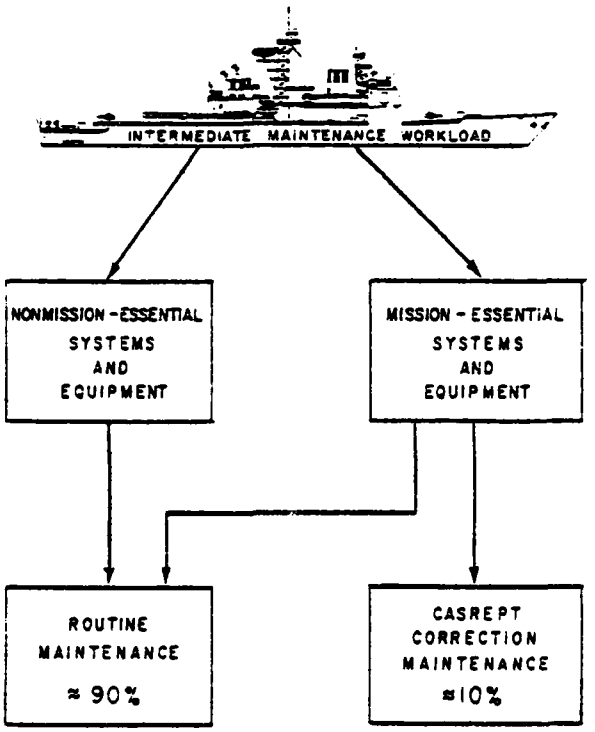


CASREPT Corrections

The equipment condition readiness rating is based upon the status of mission-essential systems and equipment. A deficiency which degrades the mission capability of these systems and equipments results in a casualty report (CASREPT). The only maintenance actions which directly and immediately affect the equipment condition readiness rating are those which correct a CASREPT situation.

Not all maintenance performed on the mission-essential systems and equipment is in response to CASREPTs. Extensive routine intermediate maintenance, both preventive and corrective, is also performed on those systems and equipments. Based on a sample of SURFLANT combatant ships over a 12-20 month period, the routine maintenance on mission-essential equipment combined with the nonmission-essential equipment maintenance comprises about 90 percent of the total intermediate maintenance workload, while CASREPT correction work is about 10 percent of the total (Figure 2-2).

FIGURE 2-2. ROUTINE AND CASREPT INTERMEDIATE MAINTENANCE



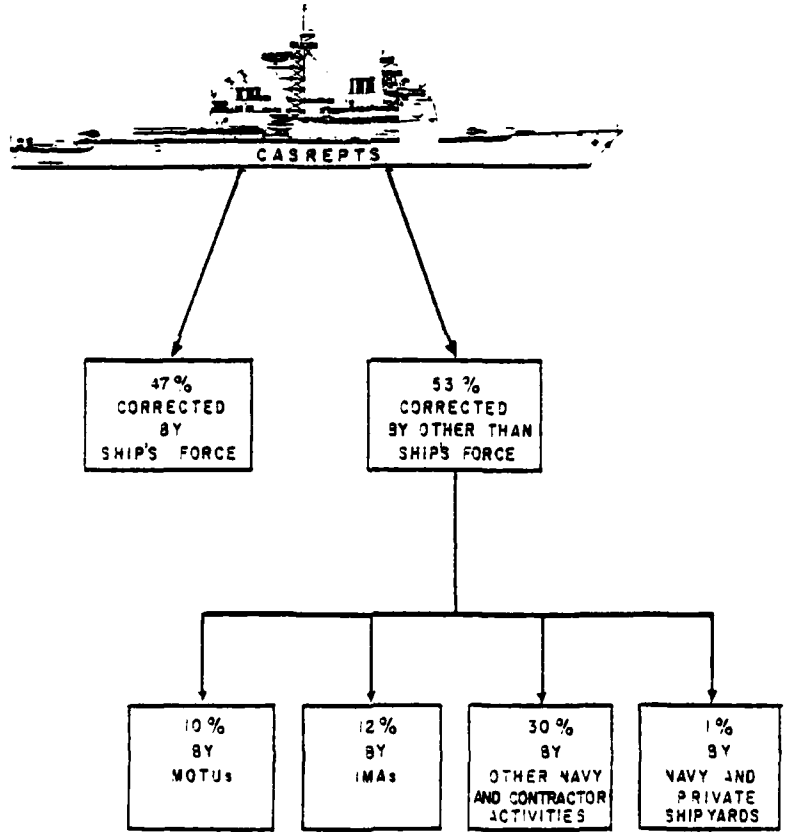
Analysis of CASREPTs for eight SURFLANT combatant ships revealed that approximately 47 percent were corrected at the organizational level by ship's force; MOTUs assisted the ship's force on another 10 percent. The IMAs accomplished 12 percent of all CASREPTs, or 23 percent of those beyond the capability of the ship's force. (See Figure 2-3).

Certainly, the equipment condition readiness of surface ships would be improved if more CASREPTs were corrected by ship's force, rather than by IMAs and other activities. Such a shift in workload, however, would require a significant increase in spares support, technical training, tools and test equipment, and diagnostics capability at the organizational level.

In contrast, if the IMAs accomplished more CASREPT corrections at the expense of other intermediate-level maintenance activities, the effect on equipment condition readiness during peacetime would be minimal. The wartime

effect of such a workload shift would be substantial, however. The Navy's peacetime reliance on nondeployable, shore-based maintenance activities for a significant portion of CASREPT corrections precludes the IMAs from receiving the necessary "hands-on" training to perform those repairs during wartime. As such, the Navy will be dependent upon civilian personnel, in fixed facilities outside the theater of operations, to perform the most critical wartime repairs.

FIGURE 2-3. DISTRIBUTION OF CASREPT CORRECTIONS



SUSTAINABILITY

As noted previously, the total IMA workload is approximately 7.8 million man-hours annually. About 75 percent of those hours are in support of hull, mechanical, and electrical repairs. The IMAs perform substantially fewer

repairs in support of weapon systems and sensors (only 6 percent).[1] Most of these more complex equipments are maintained by nondeployable, shore-based activities. Those same activities also dominate intermediate-level CASREPT corrections, since most CASREPTs are on weapons and sensors.

As new ships, technologies, weapon systems, and sensors enter the fleet, the associated growth in electronic, weapon, and sensor equipments will establish an even stronger dependence upon the shore establishment for the support of that equipment. In wartime, the Navy's deployable IMA assets will be performing hull, mechanical, and electrical repairs in the combat theater, while critical, mission-essential equipments will likely be transported to CONUS for repair. As a consequence, the IMAs will have a major role in sustaining fleet mobility but only a minor role in aiding the fleet to fight and defend itself.

IMA PERFORMANCE

IMA Problems

A previous survey of Navy intermediate maintenance identified a number of problems affecting IMA performance.[2] Those problems ranged from shortages of IMA-experienced managers/technicians and highly-specialized essential NECs, to inadequate management tools (such as useful performance measures, work standards and production information), to inaccurate parts allowance lists. The specific problem areas are shown in Table 2-1.

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[1]The attachment to Appendix A identifies the IMA production categories used to classify the sensors and weapon systems work.

[2]A complete discussion of the problems and the Navy's initiatives to correct them are provided in "A Survey of Navy Intermediate Maintenance," Interim Report (Task ML114), October 1981.

TABLE 2-1. IMA PROBLEM AREAS

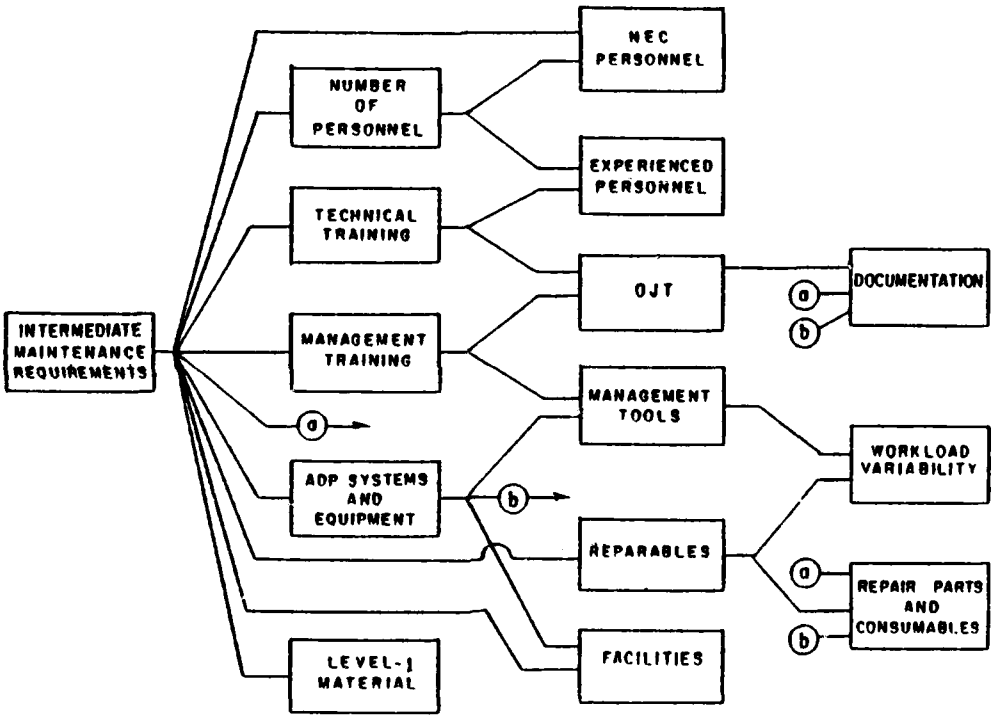
Personnel	**Training**
- IMA-Experienced Personnel	- Management Training
- Essential NECs	- Technical Training
- Numbers of Personnel	- On-the-Job Training
Management and ADP	**Facilities and Equipment**
- Management Tools	- Support Equipment
- Definition of IMA Requirements	- Facilities and Industrial Plant Equipment
- ADP Systems and Equipment	
- Workload Variability	**Documentation**
Supply Support	- Technical Documentation
- Repair Parts and Consumables	- Allowance Lists
- Reparables	- SM&R Coding
- Level-1 Material	

Each of the problem areas shown in Table 2-1 affects IMA performance. If experienced, trained mechanics are not available, repair parts are in short supply, or parts allowance lists are inaccurate, then the IMAs will not be able to perform all expected repairs. But the most far-reaching problem is that the Navy has not sufficiently defined the maintenance mission for its surface ship IMAs in terms of the mission essentiality of equipment (the second problem area under Management and ADP in Table 2-1). The IMAs are expected to perform as many hull, mechanical, and electrical repairs as needed, to the limit of their capacity. But the absence of a clear mission responsibility, especially for the electronics-based equipments, contributes to the IMAs having only a minor role in supporting equipment most likely to degrade mission capability in wartime and most urgently needing expeditious repair. Furthermore, solutions to most of the other IMA problem areas are inextricably linked to the IMA mission requirements. That dependency is illustrated in Figure 2-4.

As Figure 2-4 illustrates, the maintenance requirements largely determine the number of IMA personnel and their skills; they also define the focus and content of management and technical training programs and, by their

definition, shape on-the-job-training (OJT) programs. The maintenance requirements directly influence the types and quantities of resources needed to support the IMA, including facilities, reparables, Level-1 material, and ADP systems and equipment. Even those problems not directly addressed by the maintenance requirements, such as workload variability or experienced personnel, are shaped in a secondary way by its effects.

FIGURE 2-4. INTERRELATIONSHIPS AMONG IMA PROBLEMS



IMA Capability

One way to assess the effect of IMA problems on present performance is to examine the impact of those problems on current IMA capabilities. Most IMA work requests are screened by a Readiness Support Group (RSG) and then assigned to the IMA. The RSG reviews the tasks to ensure they are legitimate intermediate-level work. Before the IMA accepts the task, it reviews the work package to ensure it can meet the repair deadline (i.e., it has the trained mechanics, the tools and test equipment, and the capacity).

Approximately 35 percent of all tasks submitted by the fleet for accomplishment at the intermediate level are rejected by either the RSG or the IMA (see Appendix B). Nearly one-third of the rejections are classified as organizational-level tasks and returned for accomplishment by the ship's force. Another one-third of the rejections are for unspecified reasons; the remaining one-third can be associated with specific IMA deficiencies.

Table 2-2 shows the relationship between the previously identified problems, the rejection reasons, and the percent of tasks rejected for those reasons. As the table shows, only about one-third of the rejected tasks could be related to the previously identified problems. Twenty percent of the rejected tasks were not assigned to the IMA because of inadequate shop capacity, primarily on repair ships or tenders. (The high workload variability at the afloat IMAs is a contributing factor.) The ten percent rejected because of technical documentation is somewhat misleading. Most of those rejections occurred because the work request packages were improperly prepared, not because of inadequate technical manuals, allowance lists, etc. The only other rejection reason of note was for lack of facilities. These rejections appear to be associated with particular SIMAs and with the oldest afloat IMAs, the repair ships. The facility deficiencies are being addressed by the Navy's IMA Upgrade Program.

IMA Productivity

Another way to assess the effect of IMA problems on performance is to consider their impact on IMA productivity. However, we did not pursue this assessment for two reasons: (1) the issue of relating problems to productivity is overshadowed by the IMAs not supporting much of the critical, mission-essential equipments and (2) the Navy already has several initiatives underway which show considerable promise for increasing IMA productivity.

TABLE 2-2. EFFECT OF IMA PROBLEMS ON CAPABILITY

Problem Area	Reason for Rejection	Percent of Submitted Tasks	Percent of Rejected Tasks
Personnel/Training	Inadequate Shop Capacity	7.0	20.3
	Lack of Skills	0.2	0.6
Management and ADP	Lack of Funds	--	--
Supply Support	Lack of Repair Parts or Material	0.2	0.6
Facilities and Equipment	Lack of Facilities	1.1	3.2
	Lack of Test/Calibration Equipment	--	--
Documentation/Training	Lack of Technical Documentation	3.3	9.6
	Total	11.8	34.3
Not Applicable	Work Should Be Accomplished by Ship's Force	10.9	31.6
Not Applicable	Other (Unspecified)	11.8	34.1
	Total	34.5	100.0

CONCLUSIONS

Most of the critical intermediate-level repairs on mission-essential equipments are not being performed by IMAs. As a result, the IMAs have a minor role in assisting the fleet to meet peacetime readiness objectives. They also will have a minor role in aiding the fleet to fight and defend itself during war because the IMAs are not supporting the key systems and equipments, such as weapons and sensors. Their missions are largely determined by what historically has been accomplished, not by what needs to be accomplished. This practice has fostered the existing IMA role -- to concentrate on hull, mechanical, and electrical repairs, leaving the more complex, mission-essential equipment to be repaired by shore-based, nondeployable activities.

3. DoD DIRECT EQUIPMENT MAINTENANCE POLICY

DoD policy for direct equipment maintenance is contained in several directives and instructions (Table 3-1). It consists primarily of broadly stated principles and has little effect on the Navy's surface ship intermediate maintenance program.

TABLE 3-1. DoD MAINTENANCE DIRECTIVES AND INSTRUCTIONS

DoDD 4151.1	Use of Contractor and DoD Resources for Maintenance of Materiel
DoDD 4151.16	DoD Equipment Maintenance Program
DoDI 4151.11	Policy Governing Contracting for Equipment Maintenance Support
DoDI 4151.12	Policies Governing Maintenance Engineering Within the Department of Defense
DoDD 1130.2	Engineering and Technical Services--Management and Control
DoDD 4100.15	Commercial and Industrial-Type Activities

This chapter identifies the DoD Directives and Instructions that establish policy for the accomplishment of direct (i.e., organizational and intermediate) equipment maintenance, assesses the adequacy of that policy, and determines its effect on surface ship intermediate maintenance.

THE POLICY

Much of the direct maintenance policy of interest in this study is presented in two directives: DoD Directive (DoDD) 4151.1, "Use of Contractor and DoD Resources for Maintenance of Materiel," and DoDD 4151.16, "DoD Equipment Maintenance Program."

DoDD 4151.1, while not evident from its title, is primarily depot-oriented. It prescribes extensive direction to the Military Services on the accomplishment of depot maintenance while providing little guidance on direct

maintenance. There are, however, two key direct maintenance policy statements in the directive:

- Combat and direct combat support activities are to provide direct maintenance for assigned materiel.
- Contractor personnel may be used for direct maintenance provided they continue to provide that support during wartime.

DoDD 4151.16 covers numerous equipment maintenance topics, but addresses direct maintenance only in a few general statements:

- Maintenance will be oriented toward weapon and equipment end items as systems.
- Equipment maintenance will be performed as close as possible to the point of generation. Where the costs to establish and sustain self-sufficiency at the point of generation exceed the benefits, maintenance will be performed at other appropriate locations.
- Maintenance production operations will be managed on the basis of total cost and oriented toward effective maintenance support at the least cost.

The other directives and instructions in Table 3-1 augment the policies of DoDD 4151.1 and DoDD 4151.16. DoD Instruction (DoDI) 4151.11, "Policy Governing Contracting for Equipment Maintenance Support," provides policies and procedures for acquiring and managing equipment maintenance contracts. DoDI 4151.12, "Policies Governing Maintenance Engineering Within the Department of Defense," requires the Military Services to establish maintenance engineering capabilities and provides guidance on the utilization of maintenance engineering resources. DoDD 1130.2, "Engineering and Technical Services--Management and Control," prescribes the role of DoD and contractor engineering technicians in equipment maintenance, while DoDD 4100.15, "Commercial and Industrial-Type Activities," provides guidance on comparing Government and contractor performance of commercial and industrial-type functions, including maintenance.

ASSESSMENT OF POLICY

DoD policy on the accomplishment of direct equipment maintenance needs to be better focused. It doesn't address the role of organic intermediate maintenance units in achieving peacetime readiness objectives or in sustaining combat operations. In fact, the objective statement of DoDD 4151.16 is concerned only with equipment maintenance at least total cost. The policy also does not prescribe specific criteria for implementation nor define Military Service responsibilities for direct equipment maintenance.

The absence of explicit guidance on direct equipment maintenance is in marked contrast to that for indirect (i.e., depot) maintenance. In that area, the ASD(MRA&L) has issued extensive and far-ranging guidance to include the role of depot maintenance, the use and limits of contract support, the procedures for uniform costing, the sizing of facilities, and the programming of workload.

THE EFFECT OF POLICY

Since overall DoD policy on direct equipment maintenance is so broadly stated, it has virtually no effect on Navy surface ship intermediate maintenance. In those situations where the Navy may have problems in adhering to the thrust of the policy (such as the self-sufficiency clause) it can readily embrace other statements of policy (e.g., where the cost to sustain self-sufficiency exceeds the benefits, maintenance will be performed elsewhere).

By not requiring the Navy (along with the other Miltiary Services) to take specific actions or to meet explicit criteria, existing policy does not establish a clear objective for direct equipment maintenance. It also does not identify which equipments and systems should be organically maintained or specify the types of activities which should actually perform the maintenance. This has resulted in the IMAs (particularly the deployable tenders and repair

ships) concentrating on hull, mechanical, and electrical repairs and leaving the more critical repairs to shore-based activities. The Navy has actually executed these maintenance assignments while fully complying with existing policy. Nevertheless, the Navy appears to have traded some combat sustainability for an accommodating peacetime support structure.

4. CONCLUSIONS AND RECOMMENDATIONS

The Navy's surface ship intermediate maintenance system is essentially in balance, recognizing that a substantial portion of the workload is currently being satisfied by CIS Contractors. Even though the IMAs are the keystone of the system (they provide the largest share of support), they do not routinely perform the most critical repairs on mission-essential equipment. This situation occurs because the IMA's maintenance responsibilities are based primarily on those equipments/end items they have historically supported. The increased tendency of new system designs to rely on a two-echelon (i.e., organizational and depot) support concept also contributes.

However, the historical accomplishments of tenders, repair ships, and SIMAs should not be the basis for their mission assignments. The fleet's maintenance needs include more than the hull, mechanical, and electrical repairs upon which the IMAs have traditionally concentrated.[1] The IMAs also must support the systems and end items that are generating the most CASREPTs. Those systems and end items are primarily supported elsewhere. While this support may be cost-effective in meeting peacetime equipment readiness objectives, it has a strong negative impact on combat sustainability. For those critical systems and end items, repairs during wartime must likely be performed outside the theater of operations, with the associated long supply lines, lengthy repair times, and/or reliance on heavily taxed airlift capability.

The Navy is not the only Military Service which assigns the primary intermediate maintenance responsibility for front-line weapon systems to

[1]The newer tenders have the potential for increased weapons support, but they currently have the same production emphasis as the smaller, older tenders.

nondeployable units. Army civilians (e.g., in post maintenance shops, Civilian Labor Groups, etc.) perform most of the critical repairs on combat vehicles, for example. Consequently, Army intermediate-level mechanics are not receiving the required training in peacetime to carry out their wartime responsibilities.

In both cases, Navy surface ship and Army combat vehicle maintenance, the primary responsibility for ensuring that intermediate maintenance units can perform the tasks that contribute most to combat sustainability resides with the parent Service. Nevertheless, DoD guidance on direct maintenance is not assisting the Services in meeting the challenge. Current policy seems to foster a direct maintenance organization whose role is dictated more by peacetime cost-effectiveness considerations than by wartime readiness objectives. We believe it is time for a thorough intra-DoD discussion of the role of direct maintenance units.

> Recommendation: ASD(MRA&L) initiate a joint OSD/Service forum to discuss alternatives for improving the readiness of direct maintenance units to execute their wartime responsibilities.

Using the discussion draft directive, provided at Appendix C, as a basis for dialogue, the forum should focus on direct maintenance of mission-essential equipments, including the role of DoD civilian and contractor activities, the obstacles to military unit self-sufficiency, and the plans for supporting this equipment during wartime. The forum should be structured in a way which provides the Services with a positive opportunity to discuss this most pressing equipment maintenance problem and examine possible improvement actions which could be implemented DoD-wide. The discussion objectives should result in actions which will (1) stress the performance of direct maintenance by military units during wartime, (2) call for mission requirements to be

established for intermediate maintenance organizations, (3) prescribe consistent peacetime and wartime maintenance missions for all direct maintenance organizations, and (4) limit the direct maintenance roles of DoD civilian and contractor activities to nonmission-essential equipment and to those mission-essential equipment repairs which can be continued during wartime.

We believe these measures are essential in assisting the Military Services to improve their direct maintenance capability to meet both peacetime readiness and combat sustainability objectives.

APPENDIX A

INTERMEDIATE MAINTENANCE WORKLOAD

This appendix presents several perspectives on the Navy's surface ship intermediate maintenance workload. One shows intermediate maintenance support from the perspective of the combatant ship, whose requests for maintenance may be satisfied by a wide variety of support activities. Another uses several estimates of intermediate maintenance workload to develop a total workload figure and to define the contribution of various support activities. A third examines the role of individual IMAs in terms of the amount of work produced and the nature of the repairs performed. The fourth describes the intermediate-level backlog.

SUPPORTED SHIP PERSPECTIVE

This section describes the intermediate maintenance support received by eight Atlantic Fleet combatant ships. The support is portrayed by the number of work requests generated and satisfied.

Work request histories are maintained by the Readiness Support Group (RSG), Norfolk in a Job Status File. The file contains all intermediate-level maintenance actions submitted by Norfolk-based ships (and CASREPTs corrected at the organizational level) for both open and closed jobs. It also identifies the performing activity when work is authorized, and reasons for rejection when work is not accomplished. The file covers periods when the supported ships are in intermediate maintenance availabilities, as well as periods in between, when work may emerge unexpectedly.

The Job Status File for the eight combatant ships, for the period March 1980 through October 1981, contained 5,462 work requests. An examination of

these work requests showed that 594 were rejected by the RSG, or the IMAs, because they should have been accomplished by ship's force, while another 313 were CASREPT corrections performed by ship's force. Together these organizational-level jobs total 907 (Table A-1). Another 1,292 work requests, approximately 24 percent of the total submitted, were rejected because of deficiencies in IMA capability or capacity. The balance of the work requests (3,263) were actually satisfied at the intermediate level.

TABLE A-1. EFFECT OF WORK REQUEST SCREENING: SELECTED SHIPS

Supported Ship	Number of Months	Number of Work Requests			
		Sub-mitted	Reassigned/ Accomplished--Ship's Force	Rejected by Intermediate-Level Activities	Accomplished by Intermediate-Level Activities
USS Belknap (CG-26)	16	960	172	201	587
USS Josephus Daniels (CG-27)	17	870	167	203	500
USS Peterson (DD-969)	20	1,040	218	166	656
USS Comte De Grasse (DD-974)	17	700	96	176	428
USS Briscoe (DD-977)	14	622	68	155	399
USS Conolly (DD-979)	19	509	51	119	339
USS McCloy (FF-1038)	12	535	68	199	268
USS Nassau (LHA-4)	12	226	67	73	86
Total	--	5,462	907	1,292	3,263
Percent of Total	--	--	16.6	23.7	59.7

The jobs ultimately assigned to the intermediate level were performed by the IMAs (i.e., tenders, repair ships, and SIMAs) and a wide variety of other activities, including:

- CIS Contractors
- Naval Shipyards
- Naval Sea Center, Atlantic
- Naval Electronics Command Field Support Office
- Naval Weapons Support Center
- Afloat Staffs
- Other Navy and Contractor Activities.

The extent to which these activities contributed to the satisfaction of intermediate maintenance requirements is shown in Table A-2. IMAs performed approximately 57 percent of the workload accomplished at the intermediate maintenance level. Other Navy and Contractor Activities, although collectively large at slightly more than 20 percent, is actually composed of more than 10 activities, none of which individually contributed as much as 5 percent of the total. (The MEASURE Program primarily includes calibration of ship's equipment.)

TABLE A-2. INTERMEDIATE SUPPORT: SELECTED SHIPS

Activity	Number of Jobs	Percent of Total
Shore IMAs	961	29.5
Tenders and Repair Ships	902	27.6
CIS Contractors	376	11.5
MEASURE Program	276	8.5
Mobile Technical Units	69	2.1
Other Navy and Contractor Activities	663	20.3
Unknown	16	0.5
Total	3,263	100.0

The preceding discussion focused on the relative contributions of a variety of activities in satisfying intermediate-level jobs without regard to job priority. Yet, accomplishment of high priority jobs is more important than routine work. The extent of those high priority jobs is exemplified by the 650 CASREPTs incurred by the 8 ships over a 16-month period. As shown in Table A-3, most of the CASREPTs (83 percent) were prepared in response to minor deficiencies which did not result in the complete loss of any primary mission capability.

TABLE A-3. READINESS IMPACT OF CASREPTs

Supported Ship	Substantially Ready	Marginally Ready	Not Ready	Unknown	Total
USS Belknap (CG-26)	131	32	5	--	168
USS Josephus Daniels (CG-27)	110	7	3	14	134
USS Peterson (DD-969)	126	3	2	--	131
USS Comte de Grasse (DD-974)	32	4	-	--	36
USS Briscoe (DD-977)	27	4	1	--	32
USS Conolly (DD-979)	34	2	-	--	36
USS McCloy (FF-1038)	58	11	2	10	81
USS Nassau (LHA-4)	21	11	-	--	32
Total	539	74	13	24	650
Percent of Total	82.9	11.4	2.0	3.7	100.0

Analysis of the CASREPT jobs revealed that 307 of 650 CASREPTs (i.e., 47 percent) were corrected at the organizational level; MOTUs assisted the ship's force on another 10 percent. The remaining 281 were corrected by several intermediate activities (Table A-4).[1] The extent of each activity's contribution to CASREPT correction, however, differs significantly. Tenders, repair ships, and SIMAs correct about 28 percent of the intermediate-level CASREPTs

TABLE A-4. INTERMEDIATE-LEVEL CASREPTs: SELECTED SHIPS

Activity	Number of CASREPTs Corrected	Percent of Total
Shore IMAs	40	14.2
Tenders and Repair Ships	39	13.9
Other Navy and Contractor Activities	196	69.8
Unknown	6	2.1
Total	281	100.0

[1]CASREPTs corrected by CIS Contractors are not separately identified in the Job Status File; presumably, they are included in the Other Navy and Contractor Activities data.

which were corrected by other than the ship's force and MOTUs. This is in marked contrast to their 57 percent contribution shown in Table A-2. Conversely, the Other Navy and Contractor Activities take on added importance in CASREPT corrections, as witnessed by the significant increase in their contributions, approximately 70 percent of the intermediate-level CASREPTs.

WORKLOAD ESTIMATES

Within the past few years, several estimates of surface ship intermediate maintenance workload have been developed. Table A-5 summarizes these estimates. As the table indicates, some estimates are highly aggregated, such as those shown only for "Total Navy" (items 5 and 8); others are for specific organizations, such as those given for items 1 and 7. The scope of the estimates vary from the incremental workload expected to be satisfied by CIS Contractors (item 4) to the estimate which includes deferred work (item 5), or the estimate which includes submarine support (item 8). The applicable time periods also vary. Although we show FY81 estimates whenever possible, the table also shows other time periods.

Even though Table A-5 shows a variety of estimates, they can be used to develop an overall estimate of the total workload performed by each type of intermediate maintenance activity. Estimates of the surface ship IMA workload range from 6,042,100 man-hours per year (item 7) to 9,552,000 (item 8, assuming the ratio of submarine support to surface ship support is 52:48). The mid-point of these estimates is approximately 7,797,100 man-hours per year. If we include intermediate work in the CIS Program (2,135,000 man-hours, the mid-point of the two estimates shown in item 4) and accomplished during restricted and technical availabilities (2,301,200 man-hours per item 6 and note "d"), the total intermediate-level workload climbs to 12,233,300 man-hours per year. The intermediate-level work performed by

TABLE A-5. ESTIMATES OF ANNUAL INTERMEDIATE WORKLOAD FOR SURFACE SHIPS

(Labor Hours in Thousands)

Item No.	Source Document (Applicable Time Period)	Mayport	Charleston	Norfolk	Little Creek	Tenders and Repair Ships	Atlantic	San Diego	Pearl Harbor	Pacific	Total Navy	Comments
1	Reference A, Table B-1 (FY 81)	949.1	702.6	2,630.2	--	--	4,281.9	2,933.2	409.0	3,342.2	7,624.1	Port workload demand based on number of home-ported ships. (Estimated Data)
2	Reference A, Table B-2 (FY 81)	327.4	275.7	343.1	328.2	--	1,274.4	1,472.2	460.4	1,932.6	3,207.0	SIMA workload capacity (Estimated Data)
3	Reference A, Page E-22 (Unspecified)						90,345 / 4,100.0			48,889 / 4,800.0	139,234 / 8,900.0	Number of jobs completed/productive man-hours expended. (Actual Data; FY probably 1976 or 1977.)
4	Reference A, Page F-3 (FY 84)										1,900.0 / 2,370.0	Expected contract (CIS) man-hours assuming with SIMA Upgrade Program/without the Program. (Estimated Data)
5	Reference A, Page F-7 (FY 81)[a]										25,006.6[b]	Data shown in source as man-years of effort to be devoted to ship intermediate maintenance; includes deferred work. (Estimated Data)
6	Reference B, Page vi (FY 77 & 78)[c]						4,914.4			5,129.0	10,043.4[d]	3M production data for ADs, ARs, and SIMAs and equivalent work (i.e., RA/TA) in Navy and commercial shipyards. (Actual Data)
7	Reference C, Appendices E-H 3/75-3/78	111.1	52.7	282.6	47.4	1,865.0[e]	2,358.8			3,683.3	6,042.1	Averages of 3 years of production data for all ADs/ARs/SIMAs by ship class and IMA work center. Excludes AIRLANT SIMA. (Actual Data)
8	Reference D, Page 2-5 (FY 80)										19,900.0	IMA productive workload; includes ASs and NSSFs; projections from POM-80. (Estimated Data)
9	Reference E, Page B-10 (FY 81)						3,293			4,710	8,003	IMA production extrapolated from recent IMMS performance summaries: Jan. 1981 in SURFLANT and 4th qtr. FY 80 in SURFPAC. (Estimated Data)

[a] This source also shows 72,924 man-years of depot effort which converts to 123,970,800 man-hours using a factor of 1,700 hours/year/man.

[b] Data given as 18,496 estimated man-years, not including diversions; converted to man-hours using 1,352 hours/year/man (i.e., 65 percent availability per p. E-23 of Reference A).

[c] This source shows data as a 1-year average of FY 77 and FY 78.

[d] The portion of this work accomplished by NSYs and SUPSHIPS' totals 2,301,200 man hours, with 1,516,900 in the Atlantic and 784,200 in the Pacific. This source provides data by type of supported ship and by individual IMA.

[e] Represents production of seven ADs/ARs, one more than is currently assigned to SURFLANT.

References

A - Shore Intermediate Maintenance Activity: Congressional Issues Briefing Book, Naval Sea Systems Command, undated.

B - *Ship Intermediate Maintenance Workload Analysis Report*: Notional Ship Class Man-Hours/Year Requirement (Preliminary), Naval Sea Systems Command (PMS-306), October 1979.

C - Ship Intermediate Maintenance Workload Analysis Report: Discrete Workload Analysis, Naval Sea Systems Command (PMS-306), October 1979.

D - IMA Activity Baseline Study - Final Report (Technical Report No. 1406), ORI, 19 March 1979 (prepared for Naval Sea Systems Command).

E - A Survey of Navy Intermediate Maintenance - Interim Report, Logistics Management Institute, October 1981.

Other Navy (e.g., NAVSEACENs, NAVELEX FSOs, etc.) and Contractor Activities (i.e., those performing work not included in either the CIS Program or the SUPSHIPS restricted or technical availabilities (RA/TA) contracts) and by depots during overhaul are not separately estimated. However, from Table A-2 we see that all work performed by activities other than IMAs and CIS Contractors amounts to 31 percent of all jobs, or nearly 55 percent of the IMA's workload. Since the IMA annual workload is 7,797,100 man-hours, the Other Navy and Contractor Activities workload is estimated to be approximately 4,288,400 annually. Intermediate-level work done by depots during overhauls accounts for approximately 1,102,900 man-hours annually. (The derivation of this estimate is presented in the last section of this appendix.) These estimates of the intermediate maintenance workload are summarized in Table A-6. As expected, the IMAs perform most of the intermediate-level maintenance in support of surface ships (approximately 44 percent).

TABLE A-6. ANNUAL INTERMEDIATE MAINTENANCE WORKLOAD

Activity	Man-Hours (Thousands)	Percentage of Total
IMAs	7,797.1	44.2
CIS Contractors	2,135.0	12.1
Other Navy and Contractor Activities	4,288.4	24.3
Depots:		
- RA/TA Intermediate Work	2,301.2	13.1
- Intermediate Work (During Overhaul)	1,102.9	6.3
Total	17,624.6	100.0

IMA PRODUCTION

To appreciate the contribution of individual IMAs to the estimated 7.8 million man-hours of annual workload, we examined the production data in Reference C of Table A-5 in more detail. Those data cover the three-year period of March 1975 through March 1978 for individual IMAs, by class of ship

supported. Table A-7 shows the average annual production for SURFLANT IMAs during that period. Individual IMA production ranged from 47,402 man-hours at SIMA Little Creek to more than 355,000 man-hours for the USS Sierra. The SURFLANT total was almost 2.4 million man-hours. For comparison, Surface Force, Pacific's (SURFPAC) total for this same period was approximately 3.7 million man-hours, for a Navy total of 6 million man-hours annually.

TABLE A-7. AVERAGE ANNUAL PRODUCTION: SURFLANT IMAs
(March 1975 - March 1978)

IMA	Direct Labor Hours	Percent of Total
SIMA Charleston	52,736	2.2
SIMA Little Creek	47,402	2.0
SIMA Mayport	111,138	4.7
SIMA Norfolk	282,587	12.0
USS Grand Canyon (AR-28)	168,296	7.1
USS Piedmont (AD-17)	283,949	12.0
USS Puget Sound (AD-38)	338,540	14.4
USS Shenandoah (AD-26)	155,267	6.6
USS Sierra (AD-18)	355,665	15.1
USS Vulcan (AR-5)	341,422	14.5
USS Yosemite (AD-19)	221,825	9.4
Total Atlantic	2,358,827	100.0

In contrast to the historical workload data shown in Table A-7, the current production of four SURFLANT IMAs (two SIMAs, a destroyer tender and a repair ship), by production category, is displayed in Table A-8. Note that the annual IMA production shown in Table A-8 differs substantially from that displayed in Table A-7. For example, the USS Vulcan provided significantly fewer direct labor hours, while the workload at SIMA Mayport increased by more than 100 percent. (Attachment 1 to this appendix provides the work center composition of each production category in the table.) Tables A-9 through A-12 show monthly production for each of the four IMAs.

TABLE A-8. PRODUCTION EMPHASIS OF SELECTED IMAs

(FY 81)

Production Category	Productive Man-Hours					Percent of Total
	SIMA[1] Norfolk	SIMA Mayport	USS Piedmont (AD-17)	USS Vulcan (AR-5)	Total	
Hull Work and Fabrication	53,359	114,398	109,069	61,509	338,335	36.5
Mechanical Repair	53,522	117,053	33,839	42,179	246,593	26.6
Electrical, Gyro, and Interior Communications	23,254	37,587	26,381	13,123	100,345	10.8
General Services	5,651	28,175	3,834	898	38,558	4.2
Calibration and Testing	9,769	24,139	23,139	8,900	65,947	7.1
Sensor and Weapon Repair	19,435	27,239	6,920	4,787	58,381	6.3
Instrument and Other Light Repair	13,247	13,788	20,723	8,578	56,336	6.1
Other Services	4,214	18	11,143	7,395	22,770	2.4
Total	182,451	362,397	235,048	147,369	927,265	100.0

[1]Data for 8 months.

TABLE A-9. PRODUCTIVE MAN-HOURS EXPENDED: SIMA NORFOLK

(1 January 1981 - 30 September 1981)

Month	Production Category								Total
	Hull Work and Fabrication	Mechanical Repair	Electrical, Gyro, and Interior Communication	General Services	Calibration and Testing	Sensor and Weapon Repair	Instrument and Other Light Repair	Other Services	
JAN	5,913	6,620	1,697	344	1,021	2,248	1,549	1,098	20,490
FEB	5,651	7,902	2,295	454	1,177	3,736	1,820	869	23,904
MAR	7,139	8,797	2,845	688	1,642	1,997	2,025	1,010	26,143
APR	5,602	6,626	3,274	625	1,095	2,803	1,759	908	22,692
MAY	7,762	4,939	2,804	665	1,339	1,498	1,755	313	21,075
JUN	4,574	5,300	3,021	898	1,056	2,501	1,243	--	18,593
JUL	12,086	7,359	4,715	1,195	1,582	2,79[illegible]	1,912	2	31,650
AUG	(Data Unavailable)								
SEP	4,632	5,979	2,603	782	857	1,853	[illegible],184	14	17,904
Total	53,359	53,522	23,254	[illegible],651	[illegible],769	19,435	13,247	4,214	182,451
Percent of Total	29.2	29.3	12.7	3.1	5.4	10.7	7.3	2.3	100.0
Monthly Average	6,670	6,690	2,907	706	1,221	2,429	1,656	527	22,806

TABLE A-10. PRODUCTIVE MAN-HOURS EXPENDED: SIMA MAYPORT

(FY 81)

Month	Production Category								Total
	Hull Work and Fabrication	Mechanical Repair	Electrical, Gyro, and Interior Communication	General Services	Calibration and Testing	Sensor and Weapon Repair	Instrument and Other Light Repair	Other Services	
OCT	11,585	12,482	4,593	2,888	2,936	3,582	1,278	--	39,344
NOV	9,302	10,955	3,842	2,753	2,567	2,474	1,298	--	33,191
DEC	8,288	8,798	3,509	2,469	2,692	3,074	853	--	29,683
JAN	10,836	10,770	2,899	3,003	2,671	3,379	1,397	--	34,955
FEB	8,016	6,222	2,668	2,346	1,806	2,105	787	--	23,950
MAR	7,429	6,080	1,994	2,087	1,779	2,578	909	--	21,856
APR	10,058	8,999	3,060	2,403	1,881	2,846	1,259	2	30,508
MAY	10,681	10,470	2,735	1,707	1,507	1,487	1,302	--	29,889
JUN	10,455	9,683	3,500	1,600	1,599	1,856	1,248	6	29,947
JUL	11,152	14,456	3,378	2,508	1,771	1,660	1,530	6	36,461
AUG	8,127	8,461	2,658	2,164	1,511	1,767	946	--	25,634
SEP	8,469	9,677	2,751	2,247	1,419	1,431	981	4	26,979
Total	114,398	117,053	37,587	28,175	24,139	27,239	13,788	18	362,397
Percent of Total	31.6	32.3	10.4	7.8	6.6	7.5	3.8	--	100.0
Monthly Average	9,533	9,754	3,132	2,348	2,012	2,270	1,149	2	30,200

TABLE A-11. PRODUCTIVE MAN-HOURS EXPENDED: USS PIEDMONT (AD-17)

(FY 81)

Month	Production Category								Total
	Hull Work and Fabrication	Mechanical Repair	Electrical, Gyro, and Interior Communication	General Services	Calibration and Testing	Sensor and Weapon Repair	Instrument and Other Light Repair	Other Services	
OCT	9,793	3,057	1,605	1,225	2,530	1,105	2,044	1,573	22,932
NOV	4,679	1,318	969	428	750	45	715	693	9,597
DEC	9,117	2,530	2,283	460	1,258	468	1,782	1,147	19,045
JAN	10,635	4,673	2,701	65	2,730	841	2,764	751	25,160
FEB	7,743	2,400	1,701	63	1,459	822	1,400	944	16,532
MAR	11,044	3,243	3,272	25	1,957	294	2,042	1,200	23,047
APR	9,720	3,610	2,870	16	1,837	506	1,688	1,130	21,397
MAY	8,363	1,610	2,017	157	1,552	397	2,038	697	16,831
JUN	9,147	2,216	2,010	366	1,990	682	1,894	787	19,092
JUL	12,577	5,251	2,963	708	3,261	849	1,912	1,069	28,590
AUG	6,022	1,566	1,238	88	970	413	840	369	11,506
SEP	10,229	2,375	2,752	233	2,845	498	1,604	783	21,319
Total	109,069	33,839	26,381	3,834	23,139	6,920	20,723	11,143	235,048
Percent of Total	46.4	14.4	11.2	1.6	9.8	2.9	8.8	4.7	100.0
Monthly Average	9,089	2,820	2,198	319	1,928	577	1,727	929	19,587

TABLE A-12. PRODUCTIVE MAN-HOURS EXPENDED: USS VULCAN (AR-5)

(FY 81)

Month	Production Category								Total
	Hull Work and Fabrication	Mechanical Repair	Electrical, Gyro, and Interior Communication	General Services	Calibration and Testing	Sensor and Weapon Repair	Instrument and Other Light Repair	Other Services	
OCT	3,117	1,699	801	44	513	387	376	402	7,339
NOV	5,334	3,328	650	90	1,047	462	900	523	12,334
DEC	7,987	5,334	2,373	129	956	753	713	436	18,681
JAN	8,800	5,434	2,706	183	1,410	468	912	880	20,793
FEB	3,768	2,007	490	90	438	315	288	529	7,925
MAR	4,233	6,020	861	165	300	455	469	810	13,313
APR	6,461	4,820	998	81	844	238	1,090	908	15,440
MAY	2,625	1,705	702	23	611	305	240	239	6,450
JUN	5,887	4,154	1,351	68	885	949	631	671	14,596
JUL	4,805	2,650	855	10	469	205	1,751	561	11,306
AUG	4,604	2,973	78	15	662	187	589	974	10,682
SEP	3,888	2,055	658	--	765	63	619	462	8,510
Total	61,509	42,179	13,123	893	8,900	4,787	8,578	7,395	147,369
Percent of Total	41.7	28.6	8.9	0.6	6.0	3.2	5.8	5.0	100.0
Monthly Average	5,126	3,515	1,093	75	742	399	715	616	12,281

MAINTENANCE BACKLOG

Repair work which is neither mission-degrading nor planned for corrective action within 30 days is recorded in each ship's CSMP. A summary CSMP report from SURFLANT, "Listing of Open Type Availability Group Codes," dated October 1981, shows the number of open jobs ascribed to each level of maintenance (i.e., depot, intermediate, and organizational) by ship. Table A-13 summarizes the number of open jobs in that listing by ship type and maintenance level. The maintenance backlog in SURFLANT totals more than 240,000 jobs, of which 39 percent are ascribed to the intermediate level. Destroyers lead all ship types in the total number of outstanding jobs with 67,582. Frigates have the next highest, followed closely by support ships.

TABLE A-13. SUMMARY OF OUTSTANDING JOBS IN SURFLANT

(October 1981)

Ship Type	Number of Jobs in the CSMP			
	Intermediate	Depot	Organizational	Total
Cruisers	7,695	7,379	7,785	22,859
Destroyers	25,152	21,911	20,519	67,582
Frigates	20,278	12,501	14,401	47,180
Amphibious	11,034	11,933	11,261	34,228
Mine/Patrol	3,640	2,053	1,963	7,656
Support Ships	18,390	10,501	16,765	45,656
Other Units	7,256	6,438	2,755	16,449
Master Job Catalog[1]	786	247	193	1,226
Total	94,231	72,963	75,642	242,836
Percent of Total	38.8	30.0	31.2	100.0

[1]Preplanned preventative maintenance jobs.

The scope of the intermediate maintenance backlog can be more meaningfully expressed in the direct labor hours required to complete the jobs shown in Table A-13. Using the historical production hours by ship type given in Reference C, Table A-5, we estimated the hours required to eliminate the intermediate maintenance backlog in SURFLANT (Table A-14). A total of 2,605,205 direct labor hours are needed to satisfy SURFLANT's intermediate maintenance backlog. Deferred maintenance for support ships (1,012,186 labor hours) dominates the backlog, requiring nearly 39 percent of the production hours.

The data provided in Table A-14 are obviously approximations. The backlog hours might be less if the jobs were performed at the more efficient IMAs. This factor is ignored when command averages are used. Also ignored are the acknowledged imperfections in many CSMP files. Notwithstanding, the estimates displayed in Table A-14 appear to be reasonable approximations of SURFLANT's intermediate maintenance backlog.

TABLE A-14. INTERMEDIATE MAINTENANCE BACKLOG - SURFLANT

(October 1981)

Ship Type	Number of Deferred Jobs	Average Labor Hours Per Job	Deferred Maintenance Labor Hours
Cruisers	7,695	17.39	133,816
Destroyers	25,152	22.08	555,356
Frigates	20,278	18.89	383,051
Amphibious	11,034	20.48	225,976
Mine/Patrol	3,640	18.89[1]	68,760
Support Ships	18,390	55.04	1,012,186
Other Units	7,256	28.11[2]	203,966
Master Job Catalog	786	28.11[2]	22,094
Total	94,231	--	2,605,205

[1]Used Frigate average. [2]Used overall SURFLANT average.

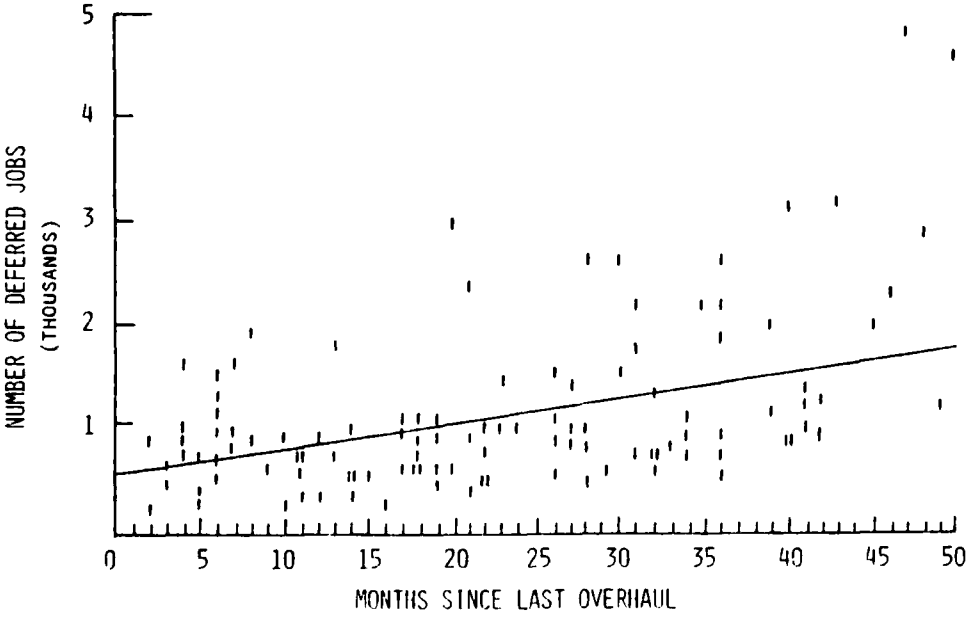
Even though data on SURFPAC's intermediate maintenance backlog were not obtained, an approximation of that backlog can be determined by assuming that the backlog in average hours per ship is the same in each type command. Currently, there are 322 active surface ships in both commands (158 in SURFLANT and 164 in SURFPAC).[2] The intermediate maintenance backlog of 2,605,205 labor hours in SURFLANT equates to 16,489 hours per ship. On this basis, SURFPAC's backlog is estimated to be 2,704,196 labor hours, which gives a total Navy active surface ship intermediate maintenance backlog of 5,309,401 labor hours.

The preceding discussion of deferred work focused on the magnitude of the backlog in SURFLANT at a given point in time, namely October 1981. It is a widely held premise that the number of deferred jobs increases with the passing of time since last overhaul. To test the validity of this premise, we analyzed the number of jobs in the CSMP and the number of months since the

[2]Naval Institute Proceedings, May 1981 (excluding aircraft carriers and submarines).

last overhaul for 125 ships in SURFLANT. Most of the 125 ships were combatants; tenders and repair ships were not included. The number of organizational, intermediate, and depot maintenance jobs in the CSMP were plotted against the number of months since last overhaul. The CSMP summary described earlier provided the number of jobs while OPNAV Notice 4710[3] was used to determine the number of months since the last overhaul. The results are shown in Figure A-1. The number of deferred jobs is shown along the ordinate; the abscissa shows months since last overhaul. Each data point represents a ship while the line represents a notional "average" ship. Figure A-1 shows that each ship comes out of overhaul with 525 jobs remaining in its CSMP and that the CSMP grows by 27.44 jobs per month. The line reflects the growth in deferred maintenance for that ship, given that all other factors remain constant and no overhauls are performed.

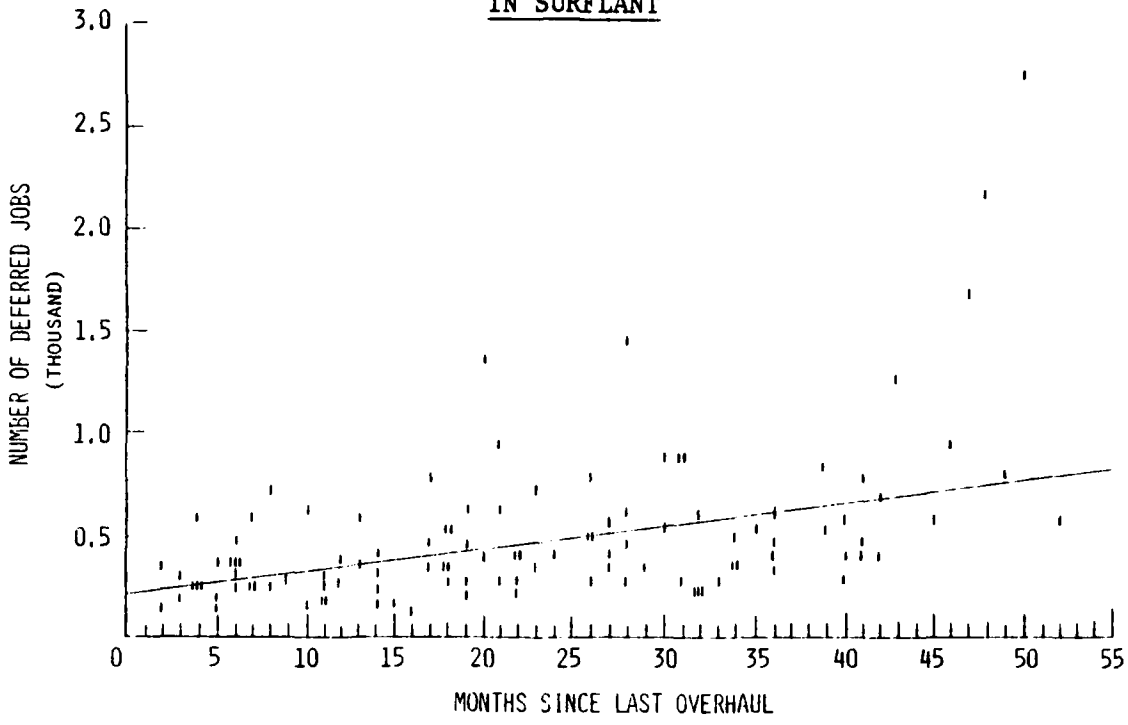
FIGURE A-1. GROWTH IN DEFERRED JOBS IN SURFLANT
(Organizational, Intermediate, and Depot)



[3]Pacific and Atlantic Fleets Overhaul Schedules, Fiscal Years 1981-1987, 31 January 1981.

Figure A-2 shows the results of a similar analysis conducted for intermediate jobs only. Here, the "average" ship comes out of overhaul with 206 intermediate-level jobs deferred and the deferred workload grows by 11.28 jobs per month per ship. At this rate, the Navy-wide growth between overhauls is approximately 1,225,200 man-hours annually for 322 active surface ships.[4]

FIGURE A-2. GROWTH IN DEFERRED INTERMEDIATE MAINTENANCE JOBS IN SURFLANT



The accomplishment of the 1,225,200 man-hours of intermediate work can be explained by comparing the status of the CSMP at the start of overhaul with the CSMP at the end of overhaul. For ships scheduled for overhaul in 1981, the average period between overhauls is 59 months. The average ship entering overhaul at 59 months has 871 deferred intermediate jobs, or 24,484 man-hours of work, in its CSMP. The average ship at the end of overhaul has 206 deferred intermediate jobs, or 5,791 man-hours of work. The difference

[4]Using a SURFLANT-wide average of 28.11 hours per job.

(18,693 man-hours of intermediate work) is either accomplished by the depot during overhaul or the requirement for that work disappears. In 1981, the Navy planned to overhaul 59 surface ships.[5] If those overhauls resulted in the accomplishment of 18,693 man-hours of intermediate maintenance work per ship, approximately 1,102,900 man-hours annually would be eliminated during overhauls.

[5] OPNAV Note 4710, loc. cit.

ATTACHMENT 1
TO
APPENDIX A

SURFACE SHIP IMA PRODUCTION CATEGORIES

This attachment lists the production categories used for classifying work center performance data of tenders, repair ships, and SIMAs.

SURFACE SHIP IMA PRODUCTION CATEGORIES

A. HULL WORK AND FABRICATION

- 11A Shipfitter Shop
- 17A Sheet Metal Shop
- 26A Welding Shop
- 26B Nuclear Welding Shop
- 31A Inside Machine Shop
- 56A Pipe Shop
- 57A Lagging and Pipe Covering Shop
- 64A Woodworking and Pattern Making Shop
- 74A Canvas Shop
- 81A Foundry

B. MECHANICAL REPAIR

- 31C Governor/Injector Shop
- 31D Valve Shop
- 31E Internal Combustion Engine Shop
- 31F Hydraulics Shop
- 31G Pump Shop
- 38A Outside Machine Shop
- 38N Nuclear Repair
- 41A Boiler Shop
- 41B Automatic Combustion Controls Shop
- 56B Refrigeration and Air Conditioning Shop

C. ELECTRICAL, GYRO, AND INTERIOR COMMUNICATIONS

- 51A Electrical Shop
- 51E Battery Shop
- 51F Gyro Shop
- 51G Interior Communications Shop
- 67J Navigation Repair

D. GENERAL SERVICES

- 06A Tool Room
- 06M Maintenance
- 08A Floating Drydock
- 25A Gas Manufacturing
- 25C CO_2 Recharge and Repair
- 25D General Engineering Service
- 72A Riggers
- 72B Divers
- 72C General Deck Service
- 72D Weight Testing
- 74B Life Raft
- 95M Movie Exchange
- 99B Painting and Preservation

E. CALIBRATION AND TESTING

10S SMMS Team (NAVSEA)
67B Electronic Calibration Shop
67F Radiac Calibration
67K Weapons Test Equipment
84A Module Test and Repair
91Q Weapons Quality Assurance
92A Sound Analysis
93A Non-Destructive Testing
93B Quality Assurance
94A Nucleonics
95A Water and Chemical Laboratory
95B Spectrometer Laboratory
96A Mechanical Instrument Repair and Calibration Shop

F. SENSOR AND WEAPON REPAIR

38B Ordnance Repair
67A Electronics Repair
67E Fire Control Shop
67G Sonar Shop
67H Antenna Shop
82A Missile and Guidance Shop
83A Launcher and Missile Handling
84B Ballistic Fire Control Shop
85A Reentry Body Shop
91A MK 37 Torpedo Shop
91B ASROC Shop
91C Torpedo Shop
91D SUBROC Shop
91E MK 48 Torpedo Shop

G. INSTRUMENT AND OTHER LIGHT REPAIR

31B Engraving Shop
35A Optical Shop
35B Instrument Shop
35C Gage Shop
35D Watch and Clock Shop
35E Typewriter Shop
51C Electrical Instruments
51D Movie Repair
56C Flexible Hose Shop
57B Rubber and Plastic Shop
64E Key and Lock Shop
67C Crypto Repair
67D Teletype Repair

H. OTHER SERVICES

10A Repair Office
10B Weapons Repair Office
10C Non-Nuclear Planning

10D Nuclear Planning
10E Technical Library
37A Print Shop
39A Photographic
64D Drafting

APPENDIX B

INTERMEDIATE LEVEL WORK REJECTIONS

This appendix examines the intermediate-level work rejections within SURFLANT. It shows the number of jobs submitted for accomplishment, the number of jobs completed, the number rejected, and the reasons for those rejections.

OVERALL SUMMARY

Table B-1 displays the number of SURFLANT intermediate-level work requests submitted, completed, and rejected during a 1-year period. The percentage of work requests rejected at the intermediate level varies from 4 percent of the jobs submitted to shore IMAs, 23 percent of the jobs submitted to an afloat IMA, to nearly 35 percent of all jobs submitted to an intermediate activity by supported ships. The remainder of this appendix provides detailed back-up to this table.

TABLE B-1. AGGREGATE WORK REJECTIONS IN SURFLANT

Organization	Number of Work Requests			Percent Rejected
	Submitted	Completed	Rejected	
CONUS IMAVs[1]	52,484	30,299	14,829	28.3
Mediterranean IMAVs	8,521	5,638	1,115	13.1
Shore IMAs[2]	20,547	15,488	773	3.8
Afloat IMAs	14,982	9,885	3,379	22.6
Supported Ships[3]	5,462	3,575	1,887	34.5

[1]Intermediate Maintenance Availability (IMAV).

[2]Data reflects 1 year's activity at SIMA Mayport and 8 months at SIMA Norfolk.

[3]Sample of eight ships for various periods ranging from 12 to 20 months.

IMAV WORK REJECTIONS

A profile of IMAV job histories is provided in monthly Post-IMAV summaries submitted by SURFLANT to the Fleet Commander. Tables B-2 and B-3 show IMAV job profiles, over a 1-year period, for CONUS and Mediterranean ships respectively.

TABLE B-2. SURFLANT IMAV JOB HISTORY - CONUS ONLY

Month	Number of Work Requests				
	Completed	In Process	IMA Rejections	Ship Cancellations	Total Submitted
JUN	2,002	219	746	143	3,110
JUL	2,636	431	1,465	191	4,723
AUG	2,777	587	1,227	232	4,823
SEP	2,144	277	1,044	213	3,678
OCT	3,186	558	1,764	220	5,728
NOV	3,087	596	1,638	278	5,599
DEC	2,257	332	1,212	179	3,980
JAN	2,555	380	1,565	253	4,753
FEB	2,866	377	1,256	315	4,814
MAR	1,174	263	612	61	2,110
APR	2,860	547	1,242	198	4,847
MAY	2,755	316	1,058	190	4,319
Total	30,299	4,883	14,829	2,473	52,484
Monthly Average	2,525	407	1,236	206	4,374
Percent	57.7	9.3	28.3	4.7	100.0

TABLE B-3. SURFLANT IMAV JOB HISTORY - MEDITERRANEAN ONLY

Month	Number of Work Requests				
	Completed	In Process	IMA Rejections	Ship Cancellations	Total Submitted
JUN	653	47	39	66	805
JUL	166	79	25	27	297
AUG	344	170	33	49	596
SEP	288	47	24	38	397
OCT	727	178	108	81	1,094
NOV	454	166	19	113	752
DEC	497	75	88	92	752
JAN	392	99	153	7	651
FEB	562	97	97	4	760
MAR	826	113	281	24	1,244
APR	291	65	36	11	403
MAY	438	91	212	29	770
Total	5,638	1,227	1,115	541	8,521
Monthly Average	470	102	93	45	710
Percent	66.2	14.4	13.1	6.3	100.0

IMA WORK REJECTIONS

IMA work performance data are contained in Intermediate Maintenance Management System (IMMS) reports. Among other information, these reports display the number of jobs submitted, completed, and rejected by the reporting IMA and the reasons for the jobs being rejected. The standard rejection codes and reasons are given below:

Code	Reason
6A	Work should be accomplished by ship's force, or item can be obtained/replaced by standard stock item in the supply system
6B	Excessive shop workload
6C	Lack of skills
6D	Lack of facilities
6E	Lack of test/calibration equipment
6F	Lack of repair parts or material
6G	Lack of technical documentation
6H	Lack of funds
6I	Other

Based on FY81 IMMS reports, four IMAs rejected nearly 12 percent of the submitted jobs (Table B-4). Of the jobs rejected, more than one-third

TABLE B-4. SUMMARY OF WORK HISTORIES AT SELECTED IMAs
FY81

IMA	Jobs				Distribution of Rejections by Reason								
	Submitted	Completed	Rejected	Percent Rejected	6A	6B	6C	6D	6E	6F	6G	6H	6I
SIMA Norfolk[1]	9,654	7,336	639	6.6	60	40	31	308	16	4	17	--	163
SIMA Mayport	10,893	8,152	134	1.2	8	31	--	63	--	11	8	--	13
USS Piedmont (AD-17)	6,825	5,093	1,086	15.9	7	68	15	50	15	2	10	--	919
USS Vulcan (AR-5)	8,157	4,792	2,293	28.1	655	727	58	345	17	8	135	--	348
Total	35,529	25,373	4,152	--	730	866	104	766	48	25	170	--	1,443
Percent of Submitted	--	71.4	11.7	--	2.1	2.4	0.3	2.2	0.1	0.1	0.5	--	4.1
Percent of Rejected	--	--	100.0	--	17.6	20.9	2.5	18.4	1.2	0.6	4.1	--	34.7

[1]Data for 8 months.

(34.7 percent) were for unspecified reasons (6I). Another 21 percent were rejected for shop overload (6B), 18 percent for lack of facilities (6D), and another 18 percent because the submitted jobs were organizational level work (6A).

SUPPORTED SHIP WORK REJECTIONS

Another perspective on intermediate-level maintenance can be obtained from the supported ships. The Readiness Support Group, Norfolk maintains job status data for all maintenance actions submitted to the intermediate level by ships based at Norfolk. The RSG screens the work requests to determine the validity of the job and to assess the capability of the intermediate-level activity to perform the repairs. The job status data include both open and closed jobs and identify the performing organization (when work is authorized) and reasons for rejection (when work is not accomplished). They cover the supported ships during IMAVs as well as for periods in between, when work may emerge unexpectedly. Table B-5 summarizes the work rejections for eight ships during the period March 1980 through October 1981. It shows that slightly

TABLE B-5. WORK REJECTIONS FOR SUPPORTED SHIPS

Supported Ship	No. of Months	Jobs				Distribution of Rejections by Reason									
		Submitted	Completed	Rejected	Percent Rejected	6A	6B	6C	6D	6E	6F	6G	6H	6I	None Given
USS Belknap (CG-26)	16	960	675	285	29.7	84	94	4	5	--	--	27	--	68	3
USS Josephus Daniels (CG-27)	17	870	563	307	35.3	104	82	1	12	--	6	27	--	73	2
USS Peterson (DD-969)	20	1,040	719	321	30.9	155	20	--	4	--	1	40	--	98	3
USS Comte De Grasse (DD-974)	17	700	442	258	36.9	81	49	1	5	--	1	26	--	82	13
USS Briscoe (DD-977)	14	622	419	203	32.6	48	25	--	7	--	--	15	--	104	4
USS Conolly (DD-979)	19	509	353	156	30.6	37	14	--	13	--	2	17	--	71	2
USS McCloy (FF-1038)	12	535	300	235	43.9	36	69	1	7	--	--	18	--	100	4
USS Nassau (LHA-4)	12	226	104	122	54.0	49	34	2	5	--	--	13	--	19	--
Total	--	5,462	3,575	1,887	--	594	387	9	58	--	10	183	--	615	31
Percent of Submitted	--	--	65.5	34.5	--	10.9	7.0	0.2	1.1	--	0.2	3.3	--	11.2	0.6
Percent of Rejected	--	--	--	100.0	--	31.5	20.5	0.5	3.1	--	0.5	9.7	--	32.6	1.6

more than one-third of the submitted jobs were rejected. The reason labeled 6I (Other) accounted for nearly one-third of all work rejected, while 6A (Ship's Force Accomplish) and 6B (Excessive Shop Workload) accounted for another 52 percent.

APPENDIX C

DEPARTMENT OF DEFENSE DIRECTIVE (DISCUSSION DRAFT)

SUBJECT: DoD Equipment Maintenance Program

References:
(a) DoD Directive 4151.16, subject as above, August 30, 1972 (hereby cancelled)
(b) DoD Directive 4151.1, "Use of Contractor and DoD Resources for Maintenance of Materiel," July 15, 1982
(c) DoD Directive 1130.2, "Engineering and Technical Services --Management and Control," June 18, 1979
(d) DoD Directive 4100.15, "Commercial and Industrial Activities," February 4, 1980
(e) DoD Directive 4000.19, "Interservice, Interdepartmental and Interagency Support," October 14, 1980
(f) through (l), see Enclosure 1

A. PURPOSE

This Directive sets forth objectives, policy, and related criteria governing the use of DoD and contractor resources in satisfying DoD direct equipment maintenance requirements, in consonance with the policy set forth in references (b) through (l), and delineates Military Department and Defense Agency responsibilities for assuring the accomplishment of such equipment maintenance. Reference (a) is hereby superseded and cancelled.

B. APPLICABILITY AND SCOPE

The provisions of this Directive apply to the Military Departments and Defense Agencies having responsibilities for the maintenance of military equipment.

C. DEFINITIONS

For the purposes of this Directive, the definitions in Enclosure 2 apply.

D. OBJECTIVES

The objectives of the DoD equipment maintenance program are to ensure, at minimum total cost, that (1) the weapon and equipment end item systems are operationally ready, (2) the organizations responsible for maintaining those systems are in a state of operational readiness consistent with the mission requirements of operating or combat elements, and (3) the maintenance support structures of the Military Departments, consisting of organic, contract, and interservice resources, are capable of meeting the sustainability objectives of operating or combat elements.

E. POLICY

1. Maintenance support of military equipment is vital to the sustained application of military power. It is necessary, therefore, that the Military Departments and Defense Agencies provide an adequate program for maintenance of assigned equipment to effectively and efficiently meet sustained readiness objectives in accordance with their responsibility for military missions.

2. Equipment maintenance will be oriented toward weapon and equipment end items as systems.

3. To assure that the Military Departments have the capability to meet the sustainability objectives of combat elements, organizations responsible for equipment maintenance will support the same systems and equipments in peacetime as during military contingencies.

4. Interservice support arrangements for mission-essential equipment will be established and executed whenever such actions will prove more beneficial to the DoD in terms of effectiveness of support or economy of operations.

5. Guidance with respect to the use of DoD or contract sources to meet Defense maintenance needs is intended to ensure that:

a. The Military Departments will be self-sufficient insofar as possible in providing direct (intermediate and organizational) maintenance support of assigned mission-essential materiel. That support will be provided at the point of generation by military personnel, wherever possible, to assure attainment of established equipment readiness objectives and desired maintenance proficiency.

b. The Military Departments, when unable to establish and sustain self-sufficiency in direct maintenance of mission-essential materiel at the point of generation, will perform that maintenance at other appropriate locations. The use of other sources, such as DoD civilian employees or contractual services, for such support will be limited to short-term tasks to overcome specific deficiencies unless special arrangements are made to assure that support will continue during wartime.

F. CRITERIA

1. Within the policy statements above:

a. Direct maintenance of mission-essential materiel will be accomplished by military personnel when required to assure a controlled source of equipment support of military operations under emergency or war conditions, and when essential:

(1) To retain or upgrade technical ability within the Military Department to permit effective performance of the military mission, or

(2) To provide necessary experience and information on the military requirements, design specifications, performance evaluations, and the review and control of costs, or

(3) To develop the technical competency necessary to conduct analytical evaluations of maintenance criteria, specification and performance data that are necessary to assure improved performance of military equipment.

b. Contract maintenance has its principal applications in the following areas:

(1) For accomplishment of direct maintenance requirements in support of administrative elements when the military control and performance of such work is not required for military effectiveness, personnel training, or rotation and career development of personnel.

(2) For direct maintenance support of mission-essential materiel pending the attainment of organic capability or to accommodate peak workloads of a transitory nature.

(3) When required for an interim period to attain an earlier operational status for new military materiel.

(4) For accomplishment of analytical overhaul or modification of new military materiel entering the inventory.

(5) When the extent or complexity of modification or modernization work requires the inherent technical qualifications of the original manufacturer.

c. Interservice maintenance has its principal applications in the following areas:

(1) When two or more Military Departments use the same item and the workload of one Department for the item is small in comparison to the quantity being repaired by another Department.

(2) When capability and capacity exist or can be made available through redistribution of DoD workloads.

(3) When it reduces equipment out-of-service time, decreases logistic pipeline inventories, and/or provides the potential for reducing investment and operating support costs.

G. RESPONSIBILITIES

1. Each Military Department and Defense Agency shall:

a. Designate those systems and equipments which are mission-essential materiel and publish lists of those systems and equipments.

b. Establish and publish explicit maintenance missions for military-staffed units responsible for intermediate maintenance of mission-essential systems and equipments; assure that those units are adequately trained to execute their assigned missions.

c. Assure that units responsible for direct maintenance of mission-essential materiel maintain the same systems and equipments in peacetime that they will support during military contingencies.

d. Submit annually to the ASD(MRA&L) a list of mission-essential systems and equipments for which DoD civilians or contractors routinely provide the direct maintenance support and identify the organizations (and their locations) providing that support.

e. Determine, in coordination with other Military Departments and Defense Agencies, as appropriate, those workloads which can be most effectively and economically accomplished through interservice support arrangements.

f. Request deviation from the provisions of this Directive in those cases where there are peculiar circumstances or where there are other overriding considerations.

2. The ASD(MRA&L) shall be responsible for:

a. Annual reviews of departmental maintenance programs concurrent with the OSD/OMB budget reviews of departmental programs. Conduct reviews at least annually of mission-essential weapons and equipment end item lists. Take actions necessary to insure the effective implementation of the policies intended by this Directive.

b. Final determination on all requests for deviation from the provisions of this Directive.

H. IMPLEMENTATION

Military Departments and Defense Agencies will:

1. Review applicable internal directives, regulations, and instructions, and revise them as necessary to comply with this Directive.

2. Analyze the guidance expressed herein and restate or expand it as necessary in adopting it for internal use.

3. Forward two (2) copies of each implementing document to the Assistant Secretary of Defense (Manpower, Reserve Affairs, and Logistics) within one hundred and twenty (120) days.

I. EFFECTIVE DATE

This Directive is effective immediately.

References (Continued)

(f) DoD Directive 4005.1, "DoD Industrial Preparedness Production Planning," July 28, 1972
(g) DoD Instruction 4151.11, "Policy Governing Contracting for Equipment Maintenance Support," June 11, 1973
(h) DoD Directive 5124.1, "Assistant Secretary of Defense (Manpower, Reserve Affairs and Logistics)," April 20, 1977
(i) DoD Instruction 7110.1, "DoD Budget Guidance," October 30, 1980
(j) DoD 4100.35-G, "Integrated Logistics Support Planning Guide for DoD Systems and Equipment," authorized by DoD Directive 4100.35, "Development of Integrated Logistic Support for Systems/Equipments," October 1, 1970
(k) DoD Instruction 7041.3, "Economic Analysis and Program Evaluation for Resource Management," October 18, 1972
(l) DoD Instruction 4100.33, "Operation of Commercial and Industrial-Type Activities," February 25, 1980

Enclosure 2

DEFINITIONS

1. Contract Maintenance: Any maintenance performed under contract by commercial organizations (including original manufacturers).

2. Depot Maintenance: That maintenance which is the responsibility of and performed by designated maintenance activities to augment stocks of serviceable materiel and to support organizational maintenance and intermediate maintenance activities, by the use of more extensive shop facilities, equipment and personnel of higher technical skill than are available at the lower levels of maintenance. Its phases normally consist of inspection, test, repair, modification, alteration, modernization, conversion, overhaul, reclamation, or rebuilding of parts, assemblies, subassemblies, components, equipment end items, and weapon systems; the manufacture of critical nonavailable parts; and the provision of technical assistance to intermediate maintenance organizations. Depot maintenance is normally accomplished in fixed shops, shipyards and other shore-based facilities, or by depot field teams.

3. Direct Maintenance Support: That maintenance performed to materiel while it remains under the custody of the using military command. Upon restoration to serviceable condition, the materiel normally is returned directly to service.

4. Equipment End Item: An instrument of combat or combat support employed in the accomplishment of military missions. It consists of a final combination of assemblies, parts, and materials which together perform a complete operational function and is ready for intended use, i.e., vehicle, aircraft, ship, tank, communication system.

5. Equipment Maintenance: The function of sustaining materiel in an operational status, restoring it to a serviceable condition or updating and upgrading its functional utility through modification.

6. Indirect Maintenance Support: That maintenance performed to materiel after its withdrawal from the custody of the using military command. Upon restoration to serviceable condition, the materiel is returned to stock for reissue or returned directly to the user under conditions authorized by the Military Department concerned.

7. Intermediate Maintenance: That maintenance which is the responsibility of and performed by designated maintenance activities in support of using organizations. Its phases normally consist of calibration, repair or replacement of damaged or unserviceable parts, components or assemblies; the manufacture of critical nonavailable parts; and the provision of technical assistance to using organizations. Intermediate maintenance is normally accomplished in fixed or mobile shops, tenders, or shore-based repair facilities, or by mobile teams.

8. Interservice Maintenance Support: Maintenance, either recurring or nonrecurring, performed by one Military Department, Defense Agency or element thereof in support of another Military Department or, Defense Agency element thereof.

9. Maintenance Capability: Availability of those resources, namely facilities, tools, test equipment, drawings, technical publications, trained maintenance personnel, engineering support and spare parts, required to carry out maintenance.

10. Maintenance Resources: Consists of personnel, materials, tools and equipment, facilities, technical data, and funds provided to carry out the equipment maintenance mission.

11. Materiel: Consists of all tangible items (including ships, tanks, self-propelled weapons, or aircraft, and related spares, repair parts and support equipment; but excluding real property, installations, and utilities) necessary to equip, operate, maintain and support military activities without distinction as to its application for administrative or combat purposes.

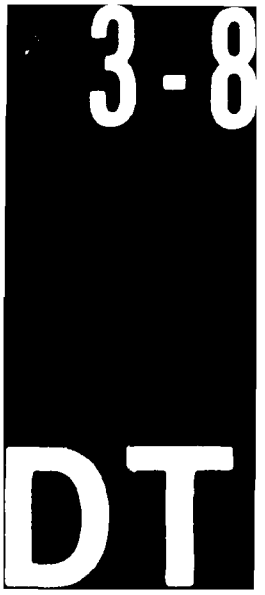
12. Mission-Essential Materiel: a. Materiel which is authorized and available to combat, combat support, combat service support, and combat readiness training forces to accomplish their assigned mission. b. For the purpose of sizing organic industrial facilities, that Service-designated materiel authorized to combat, combat support, combat service support, and combat readiness training forces and activities, including Reserve and National Guard activities, which is required to support approved emergency and/or war plans, and where the materiel is used to: (1) destroy the enemy or his capacity to continue war; (2) provide battlefield protection of personnel; (3) communicate under war conditions; (4) detect, locate, or maintain surveillance over the enemy; (5) provide combat transportation and support of men and materiel; and (6) support training functions, but is also suitable for use under emergency plans to meet purposes enumerated above.

13. Organic Maintenance: That maintenance performed by a Military Department under military control utilizing government-owned or controlled facilities, tools, test equipment, spares, repair parts, and military or civilian personnel.

14. Organizational Maintenance: That maintenance which is the responsibility of and performed by a using organization on its assigned equipment. Its phases normally consist of inspecting, servicing, lubricating, adjusting, and replacing parts, minor assemblies, and subassemblies.

15. Subsystem: A major functional part of a weapon or equipment end item, usually consisting of several components, essentially operationally complete within the system.

16. Weapon System: A final combination of subsystems, components, parts, and materials which make up an entity utilized in combat, either offensively or defensively, to destroy, injure, defeat, or threaten the enemy.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